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EP(AT,BE,CH,CY,DE,DK,ES,FI,FR,GB,GR,IE,IT,LU,MC,NL,PT,SE),AU,CA,JP
(71) **Applicant**
Name AVIDDO Technology, Incorporated
Name (in original language) AVID TECHNOLOGY,INC.
Address American Massachusetts 01876, TEYUKUSUBARI, the Wang Park waist, metropolitan technology Park
The address or an address sale order online processing system notation
Metropolitan Technology Park,One Park West,Tewksbury,Massachusetts 01876,United States of America
(72) **Inventor(s)**
Name FURINKU, Craig Earl
Address American Massachusetts 01824, Chelmsford, Moore street 53
(72) **Inventor(s)**
Name KATCHATORE, Raymond Dee
Address American Massachusetts 01886, West Ford, non set lane 5
(74) **Attorney**
Patent Attorney
Name Shamoto One husband (besides four persons)
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(57) **Abstract**

The system which performs the real-time rendering of HD video data containing the effect which the effect added to high definition (HD) video data added **which added and real-time beforehand visualized** . The system into which high definition television (HDTV) resolution video is edited using a computer contains the high definition video system which has connected at least the reference standard to the video system, and a high definition storage system. At least in a reference standard, resizer reformats high definition video data into resolution for real-time processing and prior visualization.

Claim(s)

Claim 1 It is a nonlinear video edit system. Store video data per data file. They are that random access computer reading is possible and the storage which can be re-written in. The storage which defines the image which has the scanning line with more said video data than 525, and has a component rate higher than 30 frames per second, It is the nonlinear editor which defines video program as a sequence of the part of said data file. The nonlinear editor which defines each part of a data file by the range in the reference to said data file, and said data file, The means which reads said video data from said storage according to said defined video program, Resizer which gives the output video data which has reception and the space resolution of the scanning line fewer than 525 for said video data read from said storage, and has a component rate lower than 30 frames per second, Nonlinear video edit system equipped with the display which has connected with the output of said resizer and displays said resized video data.

Claim 2 The system according to claim 1 said whose display is a passing <a thing> on scan display.

Claim 3 The system according to claim 1 said whose display is an interlace format display.

Claim 4 It is the nonlinear system for edit of high definition video data. That random access computer reading is possible and the storage system which can be re-written in which stores high definition video data per data file, It is high definition video system. The high definition video data router which derives reception and this high definition video data from said storage system for high definition video data to the 1st and 2nd outputs, Resizer which has the output at least whose reference standard have connected with the 1st output of said router and gives resolution video data based on said high definition video data, ****** and high definition video system Nonlinear system equipped with the display on which at least said reference standard receives resolution video data from the output of said resizer.

Claim 5 The system according to claim 2 said whose display is a passing <a thing> on scan display.

Claim 6 The system according to claim 2 said whose display is an interlace format

display.
Claim 7 Furthermore, the nonlinear system containing the high definition coder / decoder connected between said storage systems and said high definition routers according to claim 4.
Claim 8 Furthermore, the nonlinear system containing the digital video effect module which accelerates the rendering actuation which said nonlinear system linked to said high definition router performs according to claim 4.
Claim 9 Further Processor with which it is at least two the high definition coder / decoder processors which have been connected between said storage systems and said high definition routers, and said high definition video router receives the high definition video data of at least two streams from said storage system Nonlinear system containing at least one real-time video effect module linked to said video data router according to claim 4.
Claim 10 Further At least one three-dimensions digital video effect module linked to said high definition router, They are at least three the coder / decoder processors which have been connected between said storage system and said high definition video data router. The processor with which said video data router receives the high definition video data of at least three streams from said storage system, Nonlinear system according to claim 4 which contains at least one digital video effect module for every stream connected between said coder / decoder processor, and said high definition video data router.
Claim 11 Said at least one three-dimensions digital video effect module At least at least two high definition-reference standards are resizer. At least at least two reference standards are - high definition resizer. Nonlinear system according to claim 10 by which at least a reference standard contains a three-dimensions digital video effect module.
Claim 12 It is the nonlinear system for edit of high definition video data. That random access computer reading is possible and the storage system which can be re-written in which stores high definition video data per data file, It is high definition video system. The high definition video data router which derives reception and this high definition video data from said storage system for high definition video data to the 1st and 2nd outputs, Resizer which has the output at least whose reference standard have connected with the 1st ******** of said router and gives resolution video data based on said high definition video data, The high definition output module linked to the 2nd output of said router, ****** high definition video system At least a reference standard is a video edit system. At least the reference standard which has the input which receives the output of said resizer Digital video effect module, Nonlinear system by which at least the reference standard with which at least the reference standard which visualizes in advance the video data which has the additional effect to which at least said reference standard is outputted from a digital video effect module contains a monitor is equipped with a video edit system.
Claim 13 The nonlinear system according to claim 12 which connects said high definition output module to a high definition television resolution monitor, and performs the check by looking in the degree of maximal solution image of said edit video data.
Claim 14 The nonlinear system according to claim 12 said whose high definition video data router is a multi-format router.
Claim 15 The nonlinear system according to claim 12 by which said router receives two data streams.
Claim 16 Furthermore, the nonlinear system containing at least two resizers according to claim 15.
Claim 17 Furthermore, the nonlinear system containing the digital video effect device which receives the output of said resizer according to claim 12.

Claim 18 The nonlinear system according to claim 12 by which a digital video effect module receives the output of said resizer at the rate of said high definition video data at least in said reference standard.
Claim 19 The nonlinear system according to claim 12 by which at least the reference standard with which a video edit system receives the output of said resizer at least in said reference standard contains a buffer.
Claim 20 The nonlinear system according to claim 12 by which said high definition video system contains a high definition coder / decoder processor.
Claim 21 It is the approach at least a reference standard edits high definition video data using video equipment. The step which receives high definition video data, The step which resizes said high definition video data and aligns at least said reference standard with the band of video equipment, Step from which at least said reference standard adds an effect to said resized high definition and video data by real-time using video equipment At least a reference standard on video equipment step which visualizes said resized high definition video data containing said added effect in advance by real-time the step which carries out the rendering of the high definition video data with the degree of maximal solution image with said added effect -- since -- the approach of changing.
Claim 22 Said step to resize is . The original copy of said high definition video data is saved to a data file Approach including performing LISA IJINGU to the copy of said high definition video data according to claim 21.
Claim 23 Furthermore, an approach including storing in a data file the result of said step which carries out a rendering according to claim 21.
Claim 24 It is the resizer which reformats high definition video data and is doubled with a bandwidth limit of a low grace system. The input which is the demultiplexer which separates the component of high definition video data, and receives high definition video data, Demultiplexer which has the output which sends the component which said high definition video data separated In order to reformat said high definition video data with the input which receives the output of said demultiplexer The 1st register set which has the output which sends data at the rate determined with a resizing multiplier, The input which receives the output of said 1st register set at the rate determined with said resizing multiplier, The 2nd register set which has the output which sends data with said high definition data rate, The input which receives the output of said 2nd register set with high definition data rate, The 1st buffer which has the output which sends data with a low resolution data rate It has the 2nd buffer which has the input which receives the output of said data from said 1st buffer with said low resolution data rate. Resizer which outputs the resized video data.
Claim 25 Resizer according to claim 24 whose components of said high definition video data are RUMA and a chroma component.
Claim 26 Further Resizer which operates on the chroma component of said high definition video data Resizer containing the resizer which operates on the RUMA component of said high definition video data according to claim 24.
Claim 27 Resizer according to claim 24 said whose 1st and 2nd buffers are first in first out buffers.
Claim 28 the approach of resizing high definition video data to a low grace video data format -- it is -- Step which receives high definition video data Step which carries out the filter of the horizontal component of said high definition data at the rate of said high definition video data Step which carries out the filter of the vertical component of said high definition data at the rate of low resolution data the step which outputs the resized video data -- since -- the approach of changing.
Claim 29 Further Approach containing the step which divides said high definition video data into RUMA and a chroma component according to claim 28.

Detailed Description of the Invention

0001

(Field of invention)

This invention relates to edit of high definition video data.

(Background of invention)

It is used, in order that a television (SDTV) resolution editor may exist and at least current and a reference standard may edit video data. It is possible to create a composite signal (composite) to real-time, and to edit an effect. However, if it is not after in many cases storing it in a storage system whenever HD video data which may be impossible for a (high definition HD) edit device in cost, and is edited edits, and creating an effect in order to edit the video data of high definition television (HDTV) resolution, the result of having edited HD video data cannot be checked by looking. When more edits are required, HD video data is sent and edited into an editor, and it saves to a storage system again. In this way, the edited form can be checked by looking. This process requires costs and time amount.

0002

By the uncertainty over development of a high definition television (HDTV) resolution system and a future criterion, editing HDTV video data in cost efficiency is called for. The present SDTV system cannot perform original edit of HDTV compression video data or digital video actuation, and cannot acquire the capacity which displays the edited HDTV video data with the degree of maximal solution image.

(Outline of invention)

This invention offers the system for the real-time rendering of HD video data containing the effect which the effect added to high definition (HD) video data added **which added and real-time beforehand visualized** . This system reformats HD video data and contains the resizer (resizer) to which it is made at least for a reference standard to be settled in the band limit of the (SD) device. **0003**

Therefore, one mode is a system into which high definition video data is edited. The storage system in which re-writing is **that random access computer reading is possible and** possible stores high definition video data per data file. Including a high definition video data router, high definition video data is sent out to reception from a storage system, and a high definition video system sends out high definition video data to the 1st and 2nd outputs. Resizer is connected to the 1st output of a router. Resizer has the output at least whose reference standard gives resolution video data based on high definition video data. The high definition output module is connected to the 2nd output of a router. A video edit system includes the display for visualizing in advance the video data to which at least the reference standard which has the input from which at least a reference standard receives the output of resizer added the digital video effect module and an effect like **as a reference standard** a monitor or a computer screen. Video data is a high definition frame rate, and at least a reference standard is outputted from a digital video effect module.

0004

Another mode is the approach at least a reference standard edits high definition video data using video equipment. It resizes so that at least reception and a reference standard may set high definition video data by the bandwidth of video equipment (resize). An effect is added to the high definition video data which resized at least the reference standard using video equipment by real-time, and at least a reference standard visualizes in advance the resizing version high definition video data containing the effect which carried out whether it would be capable on video equipment. The rendering of the high definition video data of the degree of maximal solution image containing the added effect is carried out.

0005
Another mode is use of the high definition television resolution monitor for checking by looking the data edited by the high definition frame rate with the degree of maximal solution image.
Another mode is use of the multi-format router as a high definition video data router.
0006
Another mode is resizing high definition video data, holding **save the original copy of high definition video data to a data file, and** the original high definition video data in memory, while it has been eternal.
0007
Another mode is storing in a data file the result of having carried out the rendering of the high definition video data of the degree of maximal solution image to which the effect's was added.
(Detailed explanation)
Drawing 1 a is the block diagram of 1 operation gestalt of the system into which high definition television (HDTV) resolution video data is edited by the single video data stream which should be edited. Drawing 1 a contains the (high definition HD) video system 104 connected to HD storage system 102 by the bus 144. As for HD video system 104, at least the reference standard is connected also to the television (SDTV) resolution frame buffer 126 by the bus 145. On the other hand, as for the television (SDTV) resolution frame buffer 126, at least the reference standard is connected to the display 138. A display 138 can be considered as passing <a thing> on or the interlace format like **as a computer display or a reference standard** the (SD) monitor. The data to display relate to a format of HD video data (for example, when HD data are a passing <a thing> on format, SD display turns into a passing <a thing> on format display). HDTV video input / output module 140 is connected to the output of a router 120, and an output is given to the HDTV monitor 142. Another edit system can find out in the United States patent application entitled "EDITING SYSTEM WITH ROUTER FOR CONNECTION TO HDTV CIRCUITRY" by Morton Tarr et al. for which it applied on April 2, 1998.
0008
What is necessary is just to usually compress a HDTV video signal using about 5:1 ratio, in order to store a digital HDTV video signal in the transmission band width of face of a standard system action (for example, system based on the U.S. television-systems committee (NTSC) or a sequential color, and memory (SECAM) specification). for example, the NTSC standard makes requirements the aspect ratio (ratio of piece pair height) of 4:3, the 525 scanning lines per screen, and a 6MHz television signal band. SECAM specification specifies the 625 scanning lines per screen, and the television signal bandwidth of 8MHz. A SDTV resolution video format is usually the 704-pixel pair of 480 lines, or the 640-pixel pair of 480 lines. By contrast, HDTV resolution video data usually makes bandwidth of 30MHz requirements, it is twice the number of scanning lines in one frame of this, and it changes an aspect ratio into 16:9. Although HDTV resolution video is usually the 1920-pixel pair of 1080 lines, in passing <a thing> on or an interlace format, another format like the 1280-pixel pair of 720 lines is sufficient. HD video data can contain all data with resolution higher than SD video data like the data of resolution higher than the 525 scanning line which has a component rate higher than 30 frames per second in 8 or 10-bit precision. HD data can be interlaced, or can be scanned to passing <a thing> on, and this invention is limited to neither of the formats.
0009
In 1 operation gestalt of this invention, by operating by real-time and carrying out the sequence of the nonlinear high definition storage system 102 at random, the single stream edit system of drawing 1 a can perform cut edit, and can output data

in the sequence shown by the desired video sequence. The storage system 102 is good for random to consider as an accessible disk array.

0010

HD video system 104 of drawing 1 a contains HD video data router 120 which sends video data for video data to reception, HD video input / output module 140, a frame buffer 122, or resizer 124. Resizer 125 adjusts data with higher resolution to the format with low resolution. For example, resizer 124 reformats HD video data, and gives the output suitable for the bandwidth of a SDTV device. A SDTV device can process the data which usually have the resolution of the less than 525 scanning lines which has the component rate of less than 30 frames per second. The output of resizer 124 is sent to the SDTV frame buffer 126. Resizer 124 reformats HDTV-video data and a SDTV expression enables it to display it on a SDTV device like an NTSC monitor or the RGB computer screen 138. Before resizer 124 reformats data, a low-pass filter is covered over data and ray ASHINGU of data is avoided. Subsequently, resizer 124 generates only desired output data.

0011

Drawing 1 b shows an example of resizer. The resizer shown in drawing 1 b operates for the RUMA component of HD video data. It is also possible to resize the chroma component of HD video data using the same resizer circuit. A demultiplexer 190 receives HD video data as an input. A demultiplexer 190 divides 148.5MHz HD video stream into two 74.25MHz streams. In another side, one of them contains a chroma component including a RUMA component. the case where a data rate is 74.25MHz -- the inside of resizer -- setting -- a site -- a programmable gate array (FPGA) is used. This rate is within the limits of an FPGA device. It is also possible to use a specified use integrated circuit (ASIC) with an alternative implementation gestalt.

0012

The operation gestalt shown in drawing 1 b performs 5:1 resizing actuation using 5-tap filter. However, the number of filter taps can be changed in case other resizing actuation is performed. Resizer changes a data rate by 1920/720 of ratios, and generates the video based on SDTV. Resizer can expand and contract video in the size of all arbitration by changing the value stored in the perpendicular counter 196, the level counter 197, and the multiplier storage section 198.

0013

The RUMA component of video is inputted into the 1st register set 192 at HD video rate, and is inputted into the 2nd register set 193 at the rate subsequently determined with a level resizing multiplier. A desired level pixel value carries out the multiplication of the five present multipliers to each input pixel, and computes them by totaling a result. A multiplier expresses the function to determine the weight given to each input pixel. After computing each of a new output pixel, when only the value determined by the level counter advances input data, the data suitable for computing the following pixel are expressed. In the actuation which reduces an input image by the ratio of N:1, a level resizing circuit is an average and generates a new pixel every 74.25 clock cycles of N individual.

0014

The output of level resizer is 74.25MHz HD component clock rate, and can be written in on FIFO195 on the selected clock cycle. Data are read from FIFO195 at SD rate of 27MHz, and perpendicular resizing actuation is performed by SD clock rate. Although perpendicular resizer operates like level resizer, before it computes the following output value, it stores not a pixel but resized Rhine.

0015

It is also possible for it to be made to perform the data in a demand clock rate to drawing 1 easily using the middle storage element which is not shown. It stores in a device or a multiplier and counted value can also be loaded with a host computer or

other control devices.

0016

In order to perform authoring, processing, and a display of multimedia data, there are seven kinds of usable systems (for example, HD video system 104). These systems change data, define the combination of different data, and create new data, and they can be used for them in order to display data on a user. The various techniques for realizing these kinds of systems are well-known in this technical field.

0017

Multimedia authoring, processing, and a regeneration system usually have the DS showing a multimedia presentation. This DS means ultimately the clip of digitization video or a source material like an audio, and the time amount range in the source material which probably defines a ****** clip using the identifier of a meaning, or the identifier of a source material like a file name. An identifier can be made into the format of being used with an equivalent data file list in order to identify the file name of a source material. It is also possible to convert the time amount range in the source into the byte range in a corresponding file using an index. This byte range can be used with the segment table of a file, and can identify the segment of required data, and the storage which detects data.

0018

A part of multimedia presentation can be expressed using the list structure. A clip can include the range in the reference to a source identifier, and the list concerned. Generally, there is such a list for every media truck within a time presentation (temporal composition). The DS which can be used since a presentation is expressed is various. In addition to the list structure, still more complicated structure is shown in the PCT public presentation application WO 93/21636 exhibited on October 23, 1993. The example of representation of others of a multimedia presentation Avid Technology, Open Media Framework Interchange Specification from Inc, Advanced Authoring Format from Multimedia Task Force, What this is also defined by by Bento from Apple Computer is included as shown in QuickTime from Apple Computer, DirectShow from Microsoft, and the PCT public presentation WO 96/26600.

0019

The DS used since it explains previously and a multimedia program is expressed can take and display a synchronization using the data of many classes. The most general example is a television program containing the motion video (in the case many two or more streams or trucks) accompanied by an audio (in the case many four or more streams or trucks), or manufacture of a film.

0020

since video and audio data can be stored in a different data file and it can combine with arbitration -- ******** -- if the demand to the data of a data file is managed efficiently, a still higher throughput can be acquired. For example, application specifies the stream which can read data, and if required, it can judge the amount of data which should be read. The process which manages this kind of reading actuation is shown in U.S. Pat. No. 5,045,940. Generally, which stream judges application about whether it has data of the minimal dose obtained for a display. There is sufficient amount of memory for the data which should be reproduced to the stream, and when an certain amount of data can be read efficiently, the data is read from a file. When it judges with the data to a certain stream being required, each segment of data is required from one store chosen from the store with which the segment is stored. In order to identify the file demanded from a store, an edit system can convert the DS showing a presentation into the range in a file name and its file.

0021

In drawing 1 a, disk buffer memory 114 can be used for example, as a round buffer,

and receives a series of digital still images. Each still image can express the single frame of the motion video data from HD storage system 102, i.e., the 2 field, or can express the single field. This is processed in order to carry out the rendering of the edited video data. For example, application software like the software used in the Media Composer edit system by Avid Technology and Inc. can reproduce and operate a series of digital still images, and can put them in in buffer memory 114. The disk buffer memory 114 holds many video frames, sends these out to a router 120 through one or more a coder / decoder processors 116 (KODEKKU), and reduces the overhead in the case of using a linear device with the nonlinear access storage system 102.

0022

A display 138 like a SDTV monitor or a computer display is connected to the SDTV frame buffer 126, and it is used in order to visualize in advance the HDTV composite signal processed so that edit specified by a user might be included. The HDTV monitor 142 is used in order to check by looking the HDTV composite signal including the edit which visualized the output in advance on reception and a SDTV device from HDTV video I/O module 140 which carried out the rendering with the degree of maximal solution image.

0023

It is also possible to control the data flow between the components in drawing 1 a, drawing 1 c or drawing 3 and drawing 5 thru/or drawing 7 using the hardware data flow interface which makes it possible to interconnect an asynchronous data-processing component using the interconnect protocol which controls the data flow between processing components. Such an interface The United States patent application number 08th of June 20, 1997 application / No. 879,981, "APPARATUS AND METHOD FOR CONTROLLING TRANSFER OF DATA BETWEEN AND PROCESSING by CRAIG R.FRINK of April 3, 1998 application The United States patent entitled OF DATA BY INTERCONNECTED DATA PROCESSING ELEMENTS", Craig R. of April 3, 1998 application "A PACKET by FRINK et al. PROTOCOL FOR ENCODING The patent application entitled AND DECODING VIDEO DATA AND DATAFLOW SIGNALS AND DEVICES FOR IMPLEMENTING THE PACKET PROTOCOL", And "METHOD by Craig R.Frink It is indicated by the United States patent application entitled AND APPARATUS FOR CONTROLLING DATA FLOW BETWEEN DEVICES CONNECTED BY A MEMORY." ** shall be contained also in this application by this reference among these. By the flow control, a processing component can be made independent of a medium or a format. This system is not limited to a flow control, but other interfaces and synchronization approaches are also usable. For example, in drawing 1 a, it is also possible to control the data flow between the data between the storage system 102 and HD video system 104, HD video system 104, and the SDTV frame buffer 126 using a data flow interface.

0024

As the system shown in drawing 1 a is changed and it is shown in drawing 1 c, you may make it include external HDTV KODEKKU 160 which has HD-D5 KODEKKU of Panasonic for the HDTV video store using a tape. It can use for the compression and expanding of HDTV video which are too large for format compatibility with the PanasonicHDTV record approach being acquired, and storing within a limit of an edit system by using this KODEKKU in the non-linear-editing (NLE) application shown in drawing 1 a. Panasonic HDTV KODEKKU can be permuted by HD KODEKKU 116, and is connected to the disk buffer memory 114 and the HDTV router 120 using the conventional approach (interface 259M and the 292M grade of Society of Motion Picture and Television Engineers (SMPTE) specification). This connection method is similarly applied to other devices containing a video data router, video I/O, and other KODEKKU devices (Sony HDCam, MPEG 2 HL@PP, etc.).

0025
When using the digital video effects (DVE) (decomposition, a superimposition, positioning of a key image, etc.) accompanied by many streams, a lot of rendering time amount may be used for the real-time single stream HDTV edit system shown in drawing 1 c. Although DVE added using the HDTV edit system of drawing 1 c can be checked by looking once it carries out the rendering of these, on the whole, it cannot be checked by looking at the time of playback.
0026
With 1 operation gestalt, rendering time amount can be shortened by adding the hardware DVE module 150 as shown in drawing 1 d, and changing the system of drawing 1 a. It connects with the HDTV video data router 120, for example, the hardware DVE module 150 is 3D. It is used in order to accelerate video actuation actuation like DVE or 2D LISA IJINGU. With this operation gestalt, including a hardware DVE module, and a frame buffer 122 and the 2nd same frame buffer, in addition to a video channel, an edit system stores an alpha channel, and is equipped with the ****** bandwidth for the concurrent access of two streams (namely, one writing in one read-out). Although this system operates like the system of drawing 1 a, instead of using software and reading the contents of the frame buffer, when carrying out the rendering of the DVE, a system reproduces one video stream, on the other hand (for example, 122), a frame buffer inputs it, subsequently it reproduces the 2nd stream, and inputs it into the direct DVE module 150. Reading the video stored in the frame buffer (for example, 122) to compensate for the video recovery from a disk (for example, 108), both streams of both pass a DVE module. It stores in the 1st frame buffer of addition of the obtained video, and the obtained video turns into source video of consecutive DVE, or can be again stored in a disk.
0027
In another modification of drawing 1 a shown in drawing 1 e, the addition of the 2nd video channel from the storage system 102 enables it to reproduce many video streams to coincidence for real-time **DVE** , and it becomes possible to visualize DVE actuation by real-time further. This includes adding the additional disk buffer 114, additional HD KODEKKU 116, and HD-1080 additional frame buffer 122 to the system of drawing 1 a. In order to carry out the rendering of many video streams, the frame buffer of a twice as many HDTV data rate as this and resolution is used for two duplex stream systems, and they capture video and an alpha channel (if an alpha channel is storable in the video which carries out a rendering, the rendering only of the background will not be carried out but it will become possible to compound a complete view). Moreover, a frame buffer is equipped also with the device for the frame delay compensation at the time of changing I/O of an element to the video pipeline who connects a video device within a system.
0028
using the HDTV video device shown in drawing 1 a as a separate structure (the case where PanasonicHD-D5 KODEKKU is used -- like), or putting it on the exterior of a computer **** -- (-- general, when using conventional linear video equipment -- as --) -- or you may also include in a single design (common in the NLE device using almost all computers -- as).
0029
With 1 operation gestalt, when the number of the streams included in a composite signal exceeds the real-time capacity (the above-mentioned system two streams) of a system including the 2nd video channel from the storage system 102, a non-real-time hardware auxiliary rendering can be used for the just explained modification system of drawing 1 a. For example, in the system shown in drawing 1 f, the first two streams can be combined among three-layer composite signals (three coincidence video streams), and the result can be stored in a frame buffer. Many

frames within a sequence can be processed for effectiveness. The 3rd frame is added to the intermediate result stored in the HDTV frame buffer (for example, 114) by using only one side of the video stream channel from a storage system (for example, 102). A video (and alpha) channel can also be stored in a disk in the state of a compression condition or un-compressing. Moreover, with the alpha channel relevant to it for video, when one side is generated, this system can be stored and can be combined with a complete view stream. Moreover, it is also possible to reduce the overhead which stores a background and stores an alpha stream in a disk.

0030

The system changed as mentioned above is equipped with real-time processing capacity, and improves rendering time amount. However, since the number of KODEKKU used within a system serves as a limit of real-time actuation, a non-real-time rendering is used in many cases. The addition of the 3rd video channel enables it to reproduce these, recording one side of two video streams. In case more video layers (equal to many streams) are combined, by real-time, a middle composite signal can be stored in a disk and can be applied immediately. It is also possible to store both video and a related alpha stream (for it to have compressed using run length encoding) for simplification, or to store separately. It is also possible to capture video using the store using a tape, whenever it creates an effect. In addition, by the additional video channel (and HD KODEKKU), video can be stored in a disk by real-time, and can be used for the continuing composite signal.

0031

Drawing 2 is the block diagram of the SDTV edit system used for the real-time HDTV edit and the digital visual effect prior visualization by 1 operation gestalt of this invention. This system enables edit of low cost by visualizing a HDTV video effect in advance using an available SDTV device, and it makes it possible to edit a video sequence further, saving the video which stored video in the storage system 202 in the original HDTV formats (for example, un-compressing, HD-D5, HDCam, MPEG 2 HL@PP, etc.). In addition, the system shown in drawing 2 is compatible with a fully-equipped real-time HDTV system.

0032

As for the system shown in drawing 2 , at least the video data storage system 202, HD video system 204, and a reference standard contain the television non-linear-editing system (SDTV NLE) 206. The storage system 202 stores HDTV video in digital one using compression and a non-compressed format including a nonlinear store like a disk 208. The video stored on a disk 208 is not changed in a non-linear-editing process, but the generating loss (generation loss) when using compression is avoided. Therefore, when operating the stored video frame, the original frame remains in the untouched state and creates a new frame or a frame sequence for new video. The storage system 202 can reproduce many streams of the HDTV video of the degree of maximal solution image stored in compression or a non-compressed format, and the maximum data rate, and can generate real-time transition effects (for example, wipe, decomposition, a picture Inn picture, etc.). Moreover, the storage system 202 can be fluctuated according to the number of streams in an edit system including the disk data router 210 and a disc controller 212.

0033

HD video system 204 is connected between HD storage system 202 and the non-linear-editing system 206. The video system 204 takes the synchronization of the video data delivered between the storage system 202 and the HD router 220 through HD KODEKKU 216 including the HD disk buffer 214. HD video data compressed before for storing is elongated using HD KODEKKU 216, and it sends to the non-linear-editing system 206 after that. Moreover, it is also possible to use HD KODEKKU 216, to compress or elongate, and to store HD video data. The HDTV

video data router 220 judges whether it sends **of the output to the non-linear-editing system 206, HD storage system 202, or HDTV video I/O240** for the ability taking in HD video data.

0034

This is formatted and the requirements for bandwidth of a repair non-linear-editing system are made to suit by incorporating HD video data from HD video data router 220, and adjusting the space resolution of HDTV video by video filtering and re-sampling using resizer 224. Resizer 224 changes HD video data into SDTV resolution by real-time. This enables it to display the SDTV expression of a HDTV image on a standard NTSC monitor or a RGB computer screen. HDTV video can hold the original aspect ratio (16:9 or 4:3), and a SDTV system can operate using passing <a thing> on or an interlace format in these aspect ratios.

0035

Drawing 2 contains the SDTV frame buffer 226 in the HD video 204 and a SDTV video effect inter module. It is also possible to control the process filled up with the SDTV frame buffer 226 using the hardware which raises system response nature and makes low the latency by the SDTV frame buffer 226. The HDTV video system 204 generates SDTV data at a fixed rate, and, on the other hand, can make a SDTV pipeline's data rate adjustable (setting to a data flow system). However, the average data rate of fixed flow data is about 21MHz. A SDTV pipeline manages the reception of the data from a frame buffer 222, using an effective signal as a processing pipeline and a part of interconnect. Software like the software used in the Media Composer edit system by Avid Technology and Inc is possible also for managing a frame buffer 222 by use of round Rink Liszt direct memory access (DMA) structure. Since the data rate of the video which reaches a frame buffer 222 is fixed, after a video flow begins, in the Media Composer edit system by Avid Technology and Inc, software like **** software can pursue the condition of a SDTV frame buffer pointer, can avoid the overrunning (overrunning) of a buffer, and can avoid read-out of a buffer when data are not yet effective.

0036

The non-linear-editing system 206 is used for real-time prior visualization of edited HD video data. The SDTV digital video effect module 232 adds desired transition effects (for example, wipe, decomposition, a picture Inn picture, etc.) to digital video data, or operates digital video data (for example, Paige Carl, a ripple, etc.). The video data containing an effect is blended with the SDTV effect module 232, and outputs the edited video data to SDTV video input / output module 234. The video data which has an effect can be visualized in advance on the SDTV monitor 236 or the computer display 238. Prior visualization includes a real-time check by looking of under the degree of maximal solution image of the effect applied to the video data. Prior visualization can save time amount. Whenever it saves the video data which could check by looking, adding an effect to video data and was edited to a tape or a disk or desires a new effect, it is because need to search the new part of this video data or video data and it is not necessary to edit it. An effect can be added using SD device, and since HD device is unnecessary to prior visualization, the cost of edit is reducible.

0037

Drawing 3 shows the alternative implementation gestalt of the SDTV edit system of drawing 2 . In drawing 3 , a SDTV frame buffer (for example, 226 of drawing 2) is not used, but it is SDTV. The NLE system 306 is connected to the direct resizer 324. The HDTV frame buffer 322 and the HDTV video router 320 control the flow of data by this operation gestalt. It is also possible to use an interface separate for read-out of memory and writing in this system. Three alternate methods which can be used in order to carry out the rendering of the HDTV video data to the degree of maximal

solution image using the system of drawing 3 are explained below.

0038

In one of the rendering approaches using the system shown in drawing 3 , the SDTV prior visualization system 206 carries out the rendering of the HDTV video data. The HD frame buffer 322 captures the HDTV video searched from the storage system 302, and edit of an effect is processed by the non-real-time one. A frame buffer 322 stores two or more HDTV frames, and helps capture of a frame, and storing on a disk.

0039

At the option using the system shown in drawing 3 , the rendering in the degree of maximal solution image of HDTV video can also be performed by using a frame buffer 322 and a real-time HDTV video device. It is also possible to carry out the rendering of the non-compressed frame of much HDTV videos for a non-compressed middle composite signal, using a frame buffer 322 as the temporary storage section. This elongates a frame, creates an effect and becomes possible by adding an additional layer combining non-compressed HD video which stored the intermediate result in the frame buffer 322, and subsequently stored it. The limit to the number of the intermediate frames in the single composite signal which carries out a rendering is decided by memory size of a frame buffer 322.

0040

In the option using the system of drawing 3 , although the rendering in the degree of maximal solution image of HDTV video can process the video data of the degree of maximal solution image, it may include using the non-real-time hardware which is not real-time. A frame buffer cuts a real-time instant HDTV data rate from the low data rate of a digital video effect.

0041

Actuation of drawing 2 is explained from this, relating with the flow chart of drawing 4 . In step 405, the HDTV video data router 220 captures HDTV video data, and sends the HDTV video data which should be stored in step 410 to the disk 208 in HD storage system. HD video data to store may be compressed or may not be compressed. HDTV video data can also be captured **also capturing by real-time from the video sources (for example, a videocassette recorder, a camera, etc.), and** by the approaches (for example, a local area network (LAN), a digital linear tape (DLT), etc.) using a computer. In step 415, the HDTV video data router 220 searches video data from HD storage system 202. The video data router 220 can be searched for edit of video data of one frame, or a nonlinear frame sequence. Before HDTV video data is sent for storing or retrieval, it may be compressed or elongated by HD KODEKKU 216. HD disk buffer memory 214 controls the flow of video data by exchanging flows-of-control information for a disc controller 212. It is also possible to control the flow of data using the interface of others like a handshaking protocol or the above-mentioned hardware data flow interface.

0042

Based on HD video data, resizer 224 adjusts HDTV video data and is SDTV. The output of SDTV resolution video data is given by doubling with the SDTV bandwidth of the NLE system 206. As discussed previously, in order to double a digital HDTV signal with standard transmission band width of face, the compression ratio of abbreviation 5-1/2:1 is needed.

0043

The resized HDTV video data is sent to the SDTV frame buffer 226. The SDTV frame buffer 226 is used in order to synchronize a transfer of the video data in the SDTV edit system 206 in step 425. The SDTV edit system 206 is added to the HDTV video data which resized the effect in step 430. An effect may also contain transition effects, such as wipe and fade.

0044
In step 435, the resized HDTV video data containing the added effect is visualized in advance on the SDTV monitor 236, the computer display 238, or other displays. By this, a user can check by looking the effect added from the variable with the low resolution, and avoids the problem accompanying the generating loss produced by carrying out the rendering of the new video for every effect, and compression of video data.
0045
In step 440, when you need video data further for edit, a process searches return to step 415 and a router searches video data from HD storage system 202. When you do not need video data any more for edit, in step 445, it carries out the rendering of the video data visualized in advance to the non-real-time one with the SDTV effect module 232 to the degree of maximal solution image using above-mentioned hardware or an above-mentioned software rendering device.
0046
In step 450, the video which carried out the rendering can be stored in the storage system 202, and, subsequently can be searched with usual on an HD device like the HDTV monitor 242 in step 455 for the check by looking with the degree of maximal solution image.
0047
Actuation of drawing 3 is similar to actuation of drawing 2 explained previously, referring to drawing 4 . However, it sets to step 425 and is SDTV. A transfer of delivery and video data controls the HDTV video data which resized the NLE system (namely, 306) from resizer 324, excluding **therefore** a SDTV frame buffer (for example, 226 of drawing 2) by HD-1080 frame buffer 322 to the direct SDTV edit system 306.
0048
Drawing 5 is the block diagram of the real-time HDTV edit system of the maximum equipment. HDTV video is used for it although the system in drawing 5 is equivalent to a SDTV edit system. This system is real-time **HD** for every video channel (color amendment, resizing, FUROPPU, an image crop, etc.). The DVE module 554 is included and it is HDTV. 3D By using the DVE module 550, it has the 3D digital video effectiveness capacity much more complicated for a transition effect and video actuation (Paige Carl, a ripple, projection warp, etc.). This system is 3D. The HDTV video router 520 which contains a mixer and downstream keying (DSK) hardware further can also be used using the DVE module 550, and many video streams can be compounded. Moreover, this system is **a quiescence graphic (for example, title) and** Silicon about real-time video. OpenGL by Graphics 3D The DSK hardware containing a product like a graphics DVE accelerator combined with the animation which carried out the rendering by real-time using software like the graphics accelerator 552 which generates the video outlet which has a key is also included. HDTV video compression is possible if HD KODEKKU 516 is used, but if non-compressed video input / output path 518 is used, non-compressed video recovery is also possible. The system shown in drawing 5 contains three video channels, in order to carry out a rendering by real-time, reproducing.
0049
Drawing 5 operates by real-time using HDTV resolution and a data rate. It is also possible for the system of drawing 5 to process SDTV video by real-time using the same structure in addition to processing of HDTV video. This system can derive SDTV video through the HDTV router 520 (a single and many streams) combining HDTV video. DVE, mixing, and other functions adjust HD video data to SDTV processing and the data rate of HDTV resolution to low resolution.
0050

It is HDTV as shown in drawing 5 a. 3D Modification to drawing 5 can also be added to the DVE module 550, and, as a result, it is SDTV. 3D It becomes a hybrid system using the DVE module 572, the HD-SD resizer 570, and the SD-HD resizer 574, and is HDTV. 3D A DVE module is replaced. When this modification system is used, SDTV resolution is used and it is 3D. D VEMO joule can be visualized in advance by real-time.

0051

Drawing 6 is the block diagram of the real-time non-compressed 3 stream real-time HDTV video system which used the acceleration graphics port (AGP) interface for the bus protocol to the circumference connection interface (PCI) bus for example, between HD video system 604 and the computer memory 652.

0052

Using two or more PCI computer buses, for example, the PCI interface of FibreChannel, the system of drawing 6 separates a HDTV data stream (64-bit PCI or 66MHzPCI(s) which are used for real-time HDTV a non-compressed format), and brings a video stream together in common high-speed host computer memory. It becomes possible to send out disk data through a PCI bus, to transmit to the host memory 652, and to transmit to HD video processing system 604 through the high performance data interface (AGP) 654 by this, subsequently. A system 604 accesses the host memory 652 using many DMA Channels in the AGP interface 654, reproduces many video streams, and captures many video streams. AGP A DMA device can also be carried out as a separate DMA device or DMA in which many coincidence contexts are possible. With 1 operation gestalt, a PCI bus can maintain the component bandwidth of 1 or 2 streams of HDTV compression video data, and becomes per **30 / about** stream thru/or 40 megabytes. AGP maintains the bandwidth of non-compressed HDTV video data.

0053

Moreover, it is also possible to form connection between the storing system 602 and HD video system 604, and to carry out the rendering of the software DVE using the AGP interface 654 and the high-speed host memory 652. A video frame buffer which is needed for the DVE actuation which needs a rendering, time amount stem correction, an input, and/or an output frame buffer is allotted in the host CPU memory 652, and HD video system 604 can also reduce the cost of video system hardware.

0054

The HDTV video stream 604 The disk data buffer 652 (in order to carry out the buffer of the data from a disc controller 612), The frame buffer 614 for carrying out the buffer of the latency at the time of accessing the disk data buffer 652, HD KODEKKU (not shown) (whether it holds inside on a PCI board) For example, the interconnect section to the interface, HDTV video I/O640, and the monitor 642 which are held outside using the digital interconnect section like HD-D5 KODEKKU of Panasonic is included. When required for effect processing (rendering) of the degree of maximal solution image, the degree HDTV frame buffer 622 of maximal solution image operates with the maximum data rate, and captures the HDTV frame. Video data is transmitted between a computer system and the HD frame buffer 622, and resizer 624 carries out the subsample (subsample) of the HDTV video of the degree of maximal solution image to the SDTV data rate of the aspect ratio (or 4:3) of 16:9. As discussed previously, the resized video is transmitted to a display 638 (namely, monitor) and a non-compressed SDTV video edit system (not shown), and real-time **DVE** and edit prior visualization are performed.

0055

A data compression is needed when the number of the system which receives constraint by PCI and the storing throughput, and non-compressed storage elements

is impossible in cost. The storage system of 1 operation gestalt of this invention can be made independent of a system if the approach by which symmetrical data access is obtained exists distributing a video bandwidth range to a HDTV device. When compressing HDTV video, or when using non-compressed HDTV video, it is good to use many storage controllers and partition PCI buses.

0056

The system of drawing 6 a is the block diagram of a real-time 3 stream non-compressed HDTV video system. The number of PCI interfaces is fluctuated with a bandwidth demand like the number of the separate PCI bus segments corresponding to the bandwidth of a system. A separate PCI bus segment is used for the system shown in drawing 6 a every HDTV non-compressed disk data buffer 614. The storage system 602 is equipped with the share data access approach, and derives a disk data packet to the disc controller corresponding to the HDTV stream which derives data. The HDTV router 620 can prepare connection of a video stream, when video actuation is performed within a device like the DVE module 650.

0057

Drawing 7 is the block diagram of a HDTV video system. Each video channel interface shown in drawing 7 is carried out in single ASIC. Each ASIC is a 64-bit PCI interface (741), a 1500 MB/s memory interface for disk data buffer 714, and HD. The DVE module 754 can be included. 2D DVE actuation can contain color amendment, a chroma and Le Maquis generating, video LISA IJINGU, and a motion effect. Each video channel interface can process video by real-time, and can interface with the HDTV data router ASIC using the high-speed desktop video interconnect section. The duplex HDTV frame buffer which has a PCI interface is controllable by single ASIC. A module 706 can also be used in order to check a HDTV composite signal by looking.

0058

It is included that "on-Rhine" is maintainable checking by looking the video which was edited and was edited into one of the advantages of this invention, without having returned to the disk or the tape and searching some videos. When at least a reference standard uses a device and it edits HDTV video, reducing required real-time HDTV configuration significant work is included in another advantage. This invention can combine the video data of HD and SD format, and can visualize an effect in advance effectively by real-time using the device of low resolution. However, the image visualized in advance is not the degree of maximal solution image. In addition, in order to prevent degradation, the original video data file is stored in the store, and edit is performed to the copy of a video data file.

0059

The edit system of this invention enables association of HDTV, a SDTV video device, and a data rate in the same system using a data flow video pipeline, the interconnect section, and the DMA controller combined through FIFO. If locked in a HDTV reference signal, whenever an output frame will be obtained from HD subsystem, only the SDTV system should synchronize with an output frame. If an external HDTV device is used with this invention when creating video from the HDTV source for SDTV distribution and, the 27MHz clock reference of a SDTV system will generate the 74.25MHz clock of a HDTV subsystem and its external configuration object.

0060

although some operation gestalten were explained until now, probably, the thing which old explanation is mere instantiation and showed not as limitation but as an example and which is not boiled too much will be clear to this contractor. Many modification and other operation gestalten are this contractor's within the limits, and it is considered that they are the things applicable to the range of this invention.

Brief Description of the Drawings

Drawing 1

Drawing 1 a is the block diagram of a high definition television (HDTV) resolution edit system.
Drawing 1 b is drawing showing the resizer by 1 operation gestalt, and is **.
Drawing 1 c is drawing showing modification to the edit system of drawing 1 a.
Drawing 1 d is drawing showing modification to the edit system of drawing 1 a.
Drawing 1 e is drawing showing modification to the edit system of drawing 1 a.
Drawing 1 f is drawing showing modification to the edit system of drawing 1 a.

Drawing 2

At least the reference standard used for HDTV edit and digital visual effect prior visualization is the block diagram of a television (SDTV) edit system.

Drawing 3

It is the block diagram of the SDTV edit system which interfaces with HDTV resizer directly by 1 operation gestalt.

Drawing 4

It is the flow chart which indicates how the SDTV edit system of drawing 2 is used for HTDV edit according to 1 operation gestalt.

Drawing 5

Drawing 5 is the block diagram of all the functions of the real-time HDTV edit system by 1 operation gestalt.
Drawing 5 a is the block diagram of the modification system of drawing 5 .

Drawing 6

Drawing 6 is the block diagram of the real-time non-compressed 3 stream HDTV video system which used the acceleration graphics port.
Drawing 6 a is the block diagram of the modification system of drawing 6 .

Drawing 7

It is the block diagram of a HDTV video system.

Drawing 1 A

Drawing 1 B

Drawing 1 C

Drawing 1 D

Drawing 1 E

Drawing 1 F

Drawing 2

Drawing 3

Drawing 4

Drawing 5

Drawing 5 A

Drawing 6

Drawing 6 A

Drawing 7

Procedure revision The decodement presentation document of the 34th article amendment of Patent Cooperation Treaty

Filing Date June 9, Heisei 12 (2000. 6.9)
Procedure amendment 1
Document to be Amended Specification
Item(s) to be Amended Claim
Method of Amendment Modification
Proposed Amendment
Claim(s)
Claim 1 It is a nonlinear video edit system,
That random access computer reading is possible and the storage which defines the image which is the storage which can be re-written in, has the scanning line with more said video data than 525, and has a component rate higher than 30 frames per second which stores video data per data file,
The nonlinear editor which is a nonlinear editor which defines a video program as a sequence of the part of said data file, and defines each part of a data file by the range in the reference to said data file, and said data file,
The means which reads said video data from said storage according to said defined video program,
At least one resizer which gives the output video data which has the input which receives said video data read from said storage, has the space resolution of the scanning line fewer than 525, and has a component rate lower than 30 frames per second,
At least one video effect module which has the output which gives the input which receives the output of said resizer, and the video data edited by real-time according to one or more effects defined for the video program,
The display which has connected with the output of said at least one video effect module, and performs prior visualization of said video data edited and resized,
******** nonlinear video edit system.
Claim 2 The system according to claim 1 said whose display is a passing <a thing> on scan display.
Claim 3 The system according to claim 1 said whose display is an interlace format display.
Claim 4 Further,
It is a high definition video system,
A system **equipped with the high definition video system which connected said resizer to said 1st output, and connected the high definition display to said 2nd output including the high definition video data router which derives reception and this high definition video data from said storage system for high definition video data to the 1st and 2nd outputs** according to claim 1.
Claim 5 The system according to claim 4 said whose high definition video data router is a multi-format router.
Claim 6 The system according to claim 4 by which said high definition video router receives two data streams.
Claim 7 The system according to claim 6 said whose at least one resizer is two or more resizers at least.
Claim 8 The system according to claim 1 by which said video effect module receives the output of said resizer at the rate of said high definition video data.
Claim 9 Furthermore, the system according to claim 1 by which at least the reference standard which receives the output of said resizer is equipped with a buffer.
Claim 10 The system according to claim 4 by which said high definition video system contains a high definition coder / decoder processor.
Claim 11 It is the approach at least a reference standard edits high definition video

data using video equipment,
It is the step which is the nonlinear editor which defines a video program as a sequence of the part of a data file, defines each part of a data file using a nonlinear editor by the range in the reference to said data file, and said data file, and contains one or more effects,
The step which receives high definition video data from that random access computer reading is possible and the data file stored on **which can be written in** the storage according to said defined video program,
The step which resizes said high definition video data and aligns at least said reference standard with the band of video equipment,
The step from which at least said reference standard adds an effect to said resized high definition and video data by real-time using video equipment,
The step to which at least a reference standard visualizes said resized high definition video data which contains said added effect on video equipment in advance by real-time,
The step which carries out the rendering of the high definition video data with the degree of maximal solution image with said added effect,
since -- the approach of changing.
Claim 12 Said step to resize is ,
The original copy of said high definition video data is saved to a data file,
LISA IJINGU is performed to the copy of said high definition video data,
The approach of ****** claim 11 publication.
Claim 13 Furthermore, an approach including storing in a data file the result of said step which carries out a rendering according to claim 11.
Procedure revision
Filing Date October 24, Heisei 12 (2000. 10.24)
Procedure amendment 1
Document to be Amended DRAWINGS
Item(s) to be Amended Complete diagram
Method of Amendment Modification
Proposed Amendment
Drawing 1